24.5

Matrix-induced autologous chondrocyte implantation (MACI®): In sheep: objective assessments including confocal arthroscopy

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Purpose: This study had the dual aims of establishing a multi-site ovine model of articular cartilage injury repair, whilst also examining the efficacy of minimally-invasive laser scanning confocal arthroscopy (LSCA) for the postoperative histological assessment of cartilage repair.
Methods and Materials: Defects (Æ6mm) were created in the trochlea and medial femoral condyle of twenty-one sheep randomised into untreated controls, matrix-induced autologous chondrocyte implantation (MACI[Ò]), or unseeded MACI treatment, then further divided into 8, 10, and 12 week time points. Repair outcomes were examined using LSCA, routine histology, macroscopic ICRS evaluation, magnetic resonance imaging (MRI), and tissue stiffness testing. Interobserver variability and score system correlation was conducted to validate system reliability in assessing cartilage repair.
Results: Assessment of MACI treatment by LSCA, MRI, histology, and macroscopic IRCS grading, illustrated improvement in repair compared to controls across all modalities. Additionally, MACI repair resembled native articular cartilage in early-stage remodeling histologically, but the stiffness of the MACI repair was inferior to the native tissue. Interobserver analysis of the blinded LSCA scoring validated our scoring protocol, with almost perfect agreement illustrated (ICC=0.9201). Furthermore, Pearson correlation analysis demonstrated that LSCA scoring correlated ($P<0.05$) to both MRI and ICRS grading.
Conclusions: The assessment of cartilage repair has been primarily limited to macroscopic assessment, variable MRI, or destructive biopsy. The development of non-destructive LSCA cartilage repair assessment will facilitate reliable, high resolution, long-term monitoring of treated lesions in both experimental animal models and clinical patients, by obviating the need for destructive mechanical biopsy.

24.6

High Resolution MRI of Matrix induced autologous chondrocyte implantation (MACI®) after 24 months

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Purpose: The objectives of this study was to evaluate the radiological outcome of MACI® in consecutive patients treated for symptomatic articular cartilage defects of the knee joint after 24 months post implantation.
Methods and Materials: This study was a prospective, monocenter, cohort study and 21 patients (85.7% males, 14.3% females; mean age 35.18 years) were followed for 24 months. The defects were localized on femoral condyles (76.2%) and on the patella (23.8%) with a mean defect size of 5.1 cm^2 (SD=2.1). All defects were treated with autologous chondrocytes seeded on a collagen Type I/III membrane (MACI®). The radiological outcome was analyzed using high resolution magnetic resonance imaging (MRI) and the MOCART score system.
Results: After 24 months 88% of the femoral grafts were completely present and in position. 76.5% of the patients showed no signs of subchondral bone edema. Complete integration of the graft with the surrounding native cartilage was found in 82% and bone integration in 94%. Two cases of graft hypertrophy occurred with femoral condyle grafts. All cases of graft hypertrophy resolved by 24 months. Adhesions occurred in 2 of the 7 patella grafts and no adhesions were seen in relation to the femoral condyle grafts. 76% of the femoral condyle grafts showed signal intensity equal to cartilage on the PD-FSE and T2W-FSE sequences and 71% on the 3D-GRE-fs sequence.
Conclusions: We conclude that MACI® is a successful and therapeutic option for the treatment of cartilage lesions of the knee. The absence of a periosteal flap significantly reduces risks due to periosteal hypertrophy.

24.7

Three-dimensional delayed gadolinium enhanced MRI of cartilage (dGEMRIC) for in vivo evaluation of reparative cartilage after matrix-associated autologous chondrocyte transplantation at 3.0T – preliminary results

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Purpose: To use a 3D-GRE sequence with two flip angles for dGEMRIC to evaluate relative glycosaminoglycan content of repair tissue after matrix-associated autologous chondrocyte transplantation(MACT).
Methods and Materials: In a phantom study T1-mapping based on a 3D-GRE sequence with different flip angle combinations was compared to standard IR sequence at 3.0T. Fifteen patients were examined after MACT in the knee at 3–13months (group I), and 19-42 months (group II). The relaxation rate (R1), calculated for repair tissue and normal hyaline cartilage was measured and mean values were compared in different postoperative intervals using analysis of variance.
Results: The flip angle combination 35°/10° provided the best agreement with IR sequence for short and long T1 values. The mean R1 for repair tissue was 2.49 versus 1.04 at the intact control site in group I and 1.90 compared to 0.81 in group II. Differences from repair tissue to control sites showed statistically significance for both groups; no significant difference was found between groups.
Conclusions: The 3D dual flip angle dGEMRIC technique optimized for cartilage imaging is comparable to standard T1 IR technique for T1 mapping. Furthermore the preliminary in vivo study demonstrates the feasibility of the technique in the evaluation of MACT patients.

29.3

Utilize of Platelet-derived growth factors for the treatment of cartilage degenerative pathology

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Purpose: The influence of the growth factors on cartilage repair is not yet widely studied and its application in clinics is still experimental. PRP (Platelet Rich Plasma) is a natural concentrate of autologous growth factors and actually is widely experimented in different fields of medicine. The method is simple, low cost and minimally invasive. The aim of our study is to determine the short-term effect of PRP in cartilage degenerative pathology.
Methods and Materials: 30 symptomatic patients (40 knees) were treated with autologous PRP intra-articular injections for degenerative cartilage pathology. Mean age of the patients was 51 years (range:35y to 80y). 3 injections were performed every 3 weeks. All patients were clinically evaluated at the end of the treatment and at 6 months follow up. IKDC, SF36, EQ-VAS, scores were used for clinical evaluation and patient stisfaction and functional status were also recorded.
Results: Statistically significant improvement of all scores was detected after treatment and was maintained at 6 months. Subjective IKDC evaluation showed a significant score enhancement from 37,9 before the treatment to 59,0 after the treatment. Significant correlation of clinical outcome with patients age was found. While the group of patients less then 60 years old have shown 85% of improvement, the group of patients over 60 showed only 30% of improvement of clinical outcome.
Conclusions: Our study have demonstrated a positive effect of treatment of degenerative cartilage pathology with Platelet-derived growth factors in middle-age patients (<60y) at short term. Medium-long term studies are needed to confirm the durability of this treatment.